Developing a community of Sanctuary stewards through a growing network of marine educators

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Priority Area: Professional Development for Teachers

Partners: Gulf of the Farallones National Marine Sanctuary, Monterey Bay National Marine Sanctuary, California Academy of Sciences, Fitzgerald Marine Reserve, Headlands Institute, YMCA Point Bonita, San Francisco State University, and Fort Funston Conservation Connection.

Target Audience: Middle and high school teachers from San Mateo, San Francisco, Alameda and Marin Counties; 166 workshop attendees

Goals and Objectives:

- Teachers will gain specific knowledge of our coastal ocean wilderness and the National Marine Sanctuaries.
- Teachers will show that they understand the need for ocean education in the classroom by implementing (or continuing to implement) the LiMPETS program and/or by increasing the amount of time spent on ocean education in the classroom.
- Returning teachers will implement the LiMPETS program independently, with minimal support from FMSA staff.

Teachers practice monitoring techniques during the *LiMPETS Introduction to Rocky Intertidal Monitoring* workshop.

Through field-based activities, teachers learn about temperature, salinity and density of the coastal ocean during the *Coastal Ecosystem Workshop*.

Project Overview:

There is a real need to promote ocean literacy in our schools. To that end, FMSA has developed and implemented a series of professional development workshops for middle and high school teachers that highlights topics related to coastal and intertidal ecology, geology, and the LiMPETS monitoring programs. Three types of workshops have been offered: Introductory LiMPETS Workshops, enrichment workshops led by guest speakers and scientists, and multi-day summer Coastal Ecosystem Workshops. In addition, we continue to support students and teachers implementing LiMPETS programs at their schools or organizations.

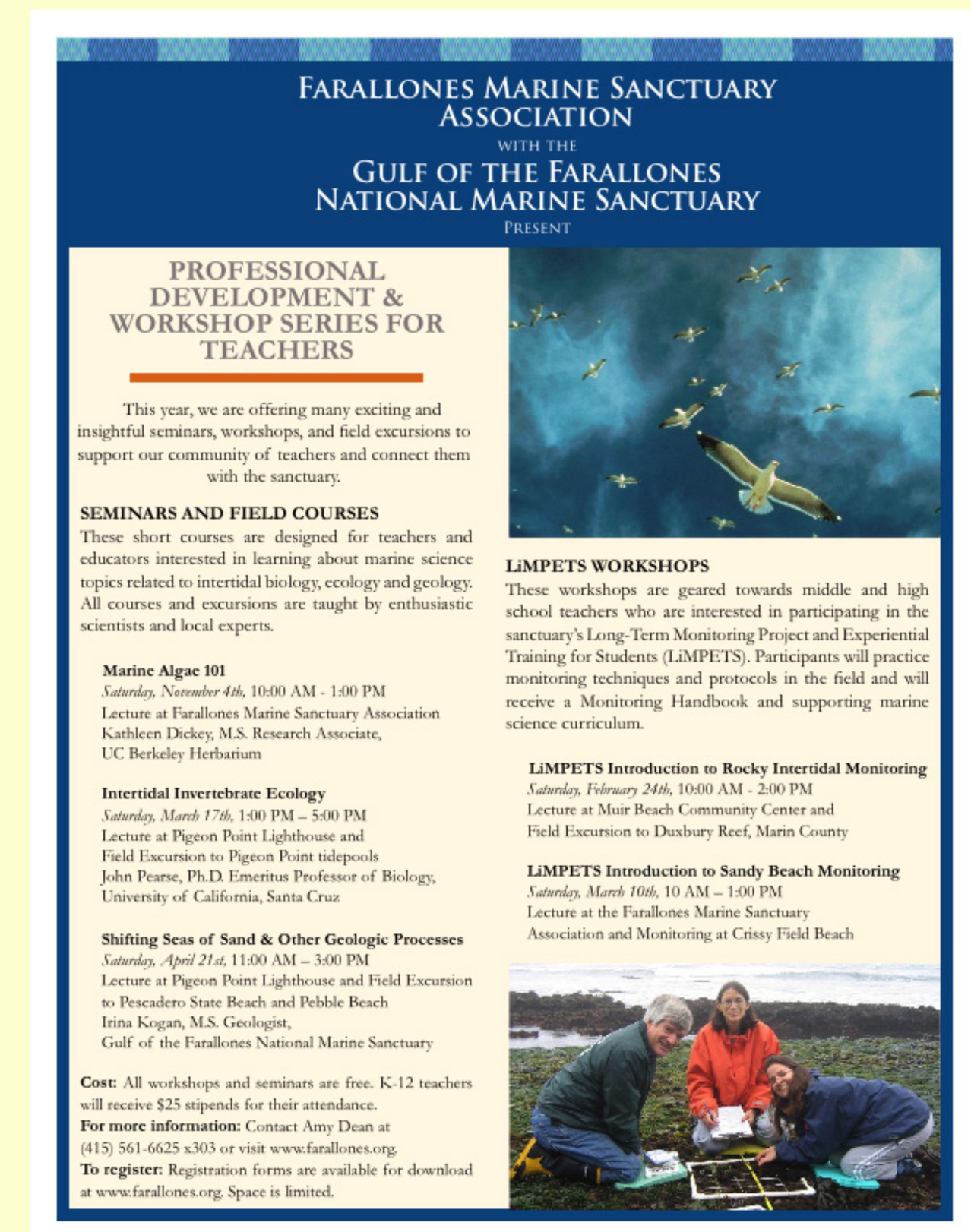
During the Coastal Ecosystem Workshop, teachers participate in a research cruise and discover the nutrients, plankton, and wind that make the local sanctuaries so productive.

Teachers learn to monitor sand crabs during the LiMPETS Introduction to Sandy Beach Monitoring workshop.

Evaluation Plan:

- Pre- and post-workshop assessment of: a) the knowledge and skills acquired by teachers who attend workshops and b) the satisfaction with the curriculum and instruction offered through the workshops.
- Follow-up survey of summer *Coastal Ecosystem Workshop* (and others) to determine if teachers are using the knowledge and resources gained at the workshops, increasing the amount of time spent on ocean science education in the classroom, and implementing the LiMPETS program with their students.

Products:



FARALLONES MARINE SANCTUARY ASSOCIATION
WITH THE
GULF OF THE FARALLONES NATIONAL MARINE SANCTUARY
PRESENT

PROFESSIONAL DEVELOPMENT & WORKSHOP SERIES FOR TEACHERS

This year, we are offering many exciting and insightful seminars, workshops, and field excursions to support our community of teachers and connect them with the sanctuary.

SEMINARS AND FIELD COURSES
These short courses are designed for teachers and educators interested in learning about marine science topics related to intertidal biology, ecology and geology. All courses and excursions are taught by enthusiastic scientists and local experts.

Marine Algae 101
Saturday, November 4th, 10:00 AM - 1:00 PM
Lecture at Farallones Marine Sanctuary Association
Kathleen Dickey, M.S. Research Associate, UC Berkeley Herbarium

Intertidal Invertebrate Ecology
Saturday, March 17th, 1:00 PM – 5:00 PM
Lecture at Pigeon Point Lighthouse and Field Excursion to Pigeon Point tidepools
John Pearse, Ph.D. Emeritus Professor of Biology, University of California, Santa Cruz

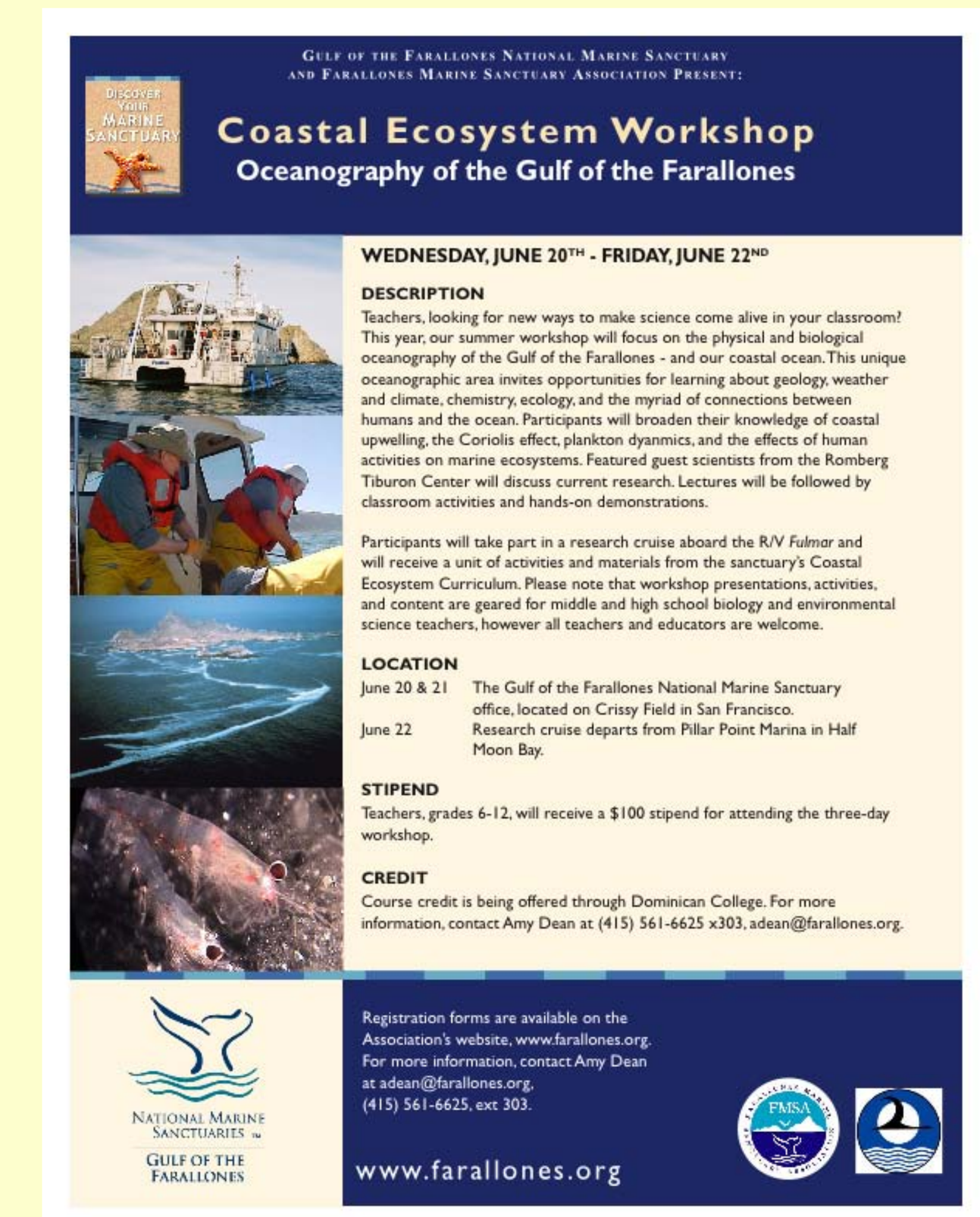
Shifting Seas of Sand & Other Geologic Processes
Saturday, April 21st, 11:00 AM – 3:00 PM
Lecture at Pigeon Point Lighthouse and Field Excursion to Pescadero State Beach and Pebble Beach
Irina Kogan, M.S. Geologist, Gulf of the Farallones National Marine Sanctuary

LiMPETS WORKSHOPS
These workshops are geared towards middle and high school teachers who are interested in participating in the sanctuary's Long-Term Monitoring Project and Experiential Training for Students (LiMPETS). Participants will practice monitoring techniques and protocols in the field and will receive a Monitoring Handbook and supporting marine science curriculum.

LiMPETS Introduction to Rocky Intertidal Monitoring
Saturday, February 24th, 10:00 AM – 2:00 PM
Lecture at Muir Beach Community Center and Field Excursion to Duxbury Reef, Marin County

LiMPETS Introduction to Sandy Beach Monitoring
Saturday, March 10th, 10 AM – 1:00 PM
Lecture at the Farallones Marine Sanctuary Association and Monitoring at Crissy Field Beach

Cost: All workshops and seminars are free. K-12 teachers will receive $25 stipends for their attendance.
For more information: Contact Amy Dean at (415) 561-6625 x303 or visit www.farallones.org.
To register: Registration forms are available for download at www.farallones.org. Space is limited.



GULF OF THE FARALLONES NATIONAL MARINE SANCTUARY AND FARALLONES MARINE SANCTUARY ASSOCIATION PRESENT:

Coastal Ecosystem Workshop
Oceanography of the Gulf of the Farallones

WEDNESDAY, JUNE 20TH - FRIDAY, JUNE 22ND

DESCRIPTION
Teachers, looking for new ways to make science come alive in your classroom? This year, our summer workshop will focus on the physical and biological oceanography of the Gulf of the Farallones - and our coastal ocean. This unique oceanographic area invites opportunities for learning about geology, weather and climate, chemistry, ecology, and the myriad of connections between humans and the ocean. Participants will broaden their knowledge of coastal upwelling, the Coriolis effect, plankton dynamics, and the effects of human activities on marine ecosystems. Featured guest scientists from the Romberg Tiburon Center will discuss current research. Lectures will be followed by classroom activities and hands-on demonstrations.

Participants will take part in a research cruise aboard the R/V *Fulmar* and will receive a unit of activities and materials from the sanctuary's Coastal Ecosystem Curriculum. Please note that workshop presentations, activities, and content are geared for middle and high school biology and environmental science teachers, however all teachers and educators are welcome.

LOCATION
June 20 & 21 The Gulf of the Farallones National Marine Sanctuary office, located on Crissy Field in San Francisco.
June 22 Research cruise departs from Pillar Point Marina in Half Moon Bay.

STIPEND
Teachers, grades 6-12, will receive a $100 stipend for attending the three-day workshop.

CREDIT
Course credit is being offered through Dominican College. For more information, contact Amy Dean at (415) 561-6625 x303, adean@farallones.org.

Registration forms are available on the Association's website, www.farallones.org. For more information, contact Amy Dean at adean@farallones.org. (415) 561-6625, ext 303.

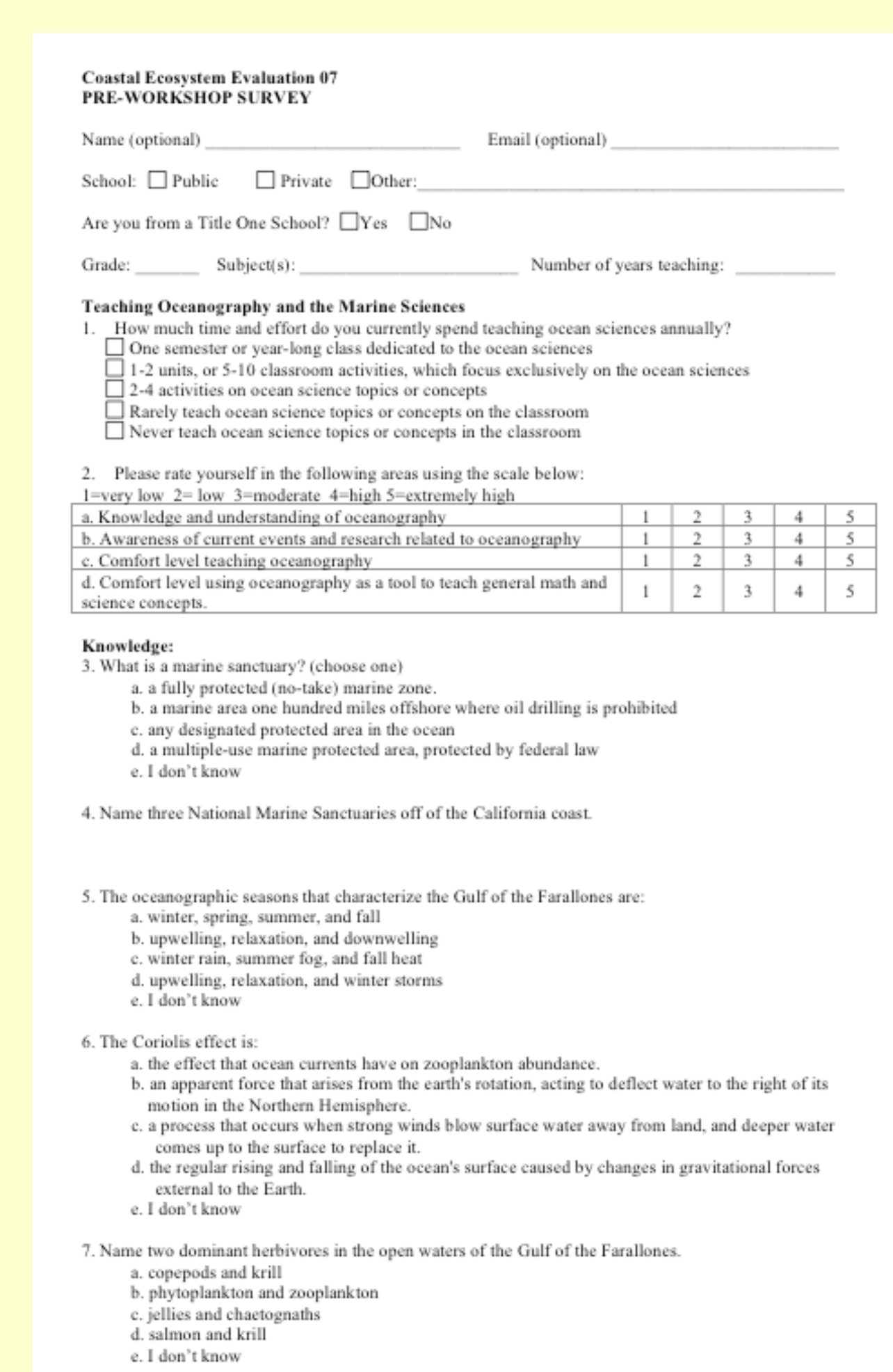
NATIONAL MARINE SANCTUARIES
GULF OF THE FARALLONES

www.farallones.org

Figure 1: Teacher Workshop Flyers 2006-2007

Left: An in depth, multi-day *Coastal Ecosystem Workshop* is offered in the summer. Workshop includes guest lectures by scientists, classroom activities, and field trips.

Right: Throughout the school year, a series of 4-5 Saturday workshops are offered. Workshops include: a) Introductory LiMPETS workshops and b) enrichment workshops designed to give our LiMPETS participants and all participating teachers more in-depth knowledge.



Coastal Ecosystem Evaluation 07
PRE-WORKSHOP SURVEY

Name (optional) ____________ Email (optional) ____________

School: ☐ Public ☐ Private ☐ Other: ____________

Are you from a Title One School? ☐ Yes ☐ No

Grade: ______ Subject(s): ____________ Number of years teaching: ______

Teaching Oceanography and the Marine Sciences
1. How much time and effort do you currently spend teaching ocean sciences annually?
☐ One semester or year-long class dedicated to the ocean sciences
☐ 1-2 units, or 5-10 classroom activities, which focus exclusively on the ocean sciences
☐ 2-4 activities on ocean science topics or concepts
☐ Rarely teach ocean science topics or concepts on the classroom
☐ Never teach ocean science topics or concepts in the classroom

2. Please rate yourself in the following areas using the scale below:
1=very low 2= low 3=moderate 4=high 5=extremely high

a. Knowledge and understanding of oceanography	1	2	3	4	5
b. Awareness of current events and research related to oceanography	1	2	3	4	5
c. Comfort level teaching oceanography	1	2	3	4	5
d. Comfort level using oceanography as a tool to teach general math and science concepts.	1	2	3	4	5

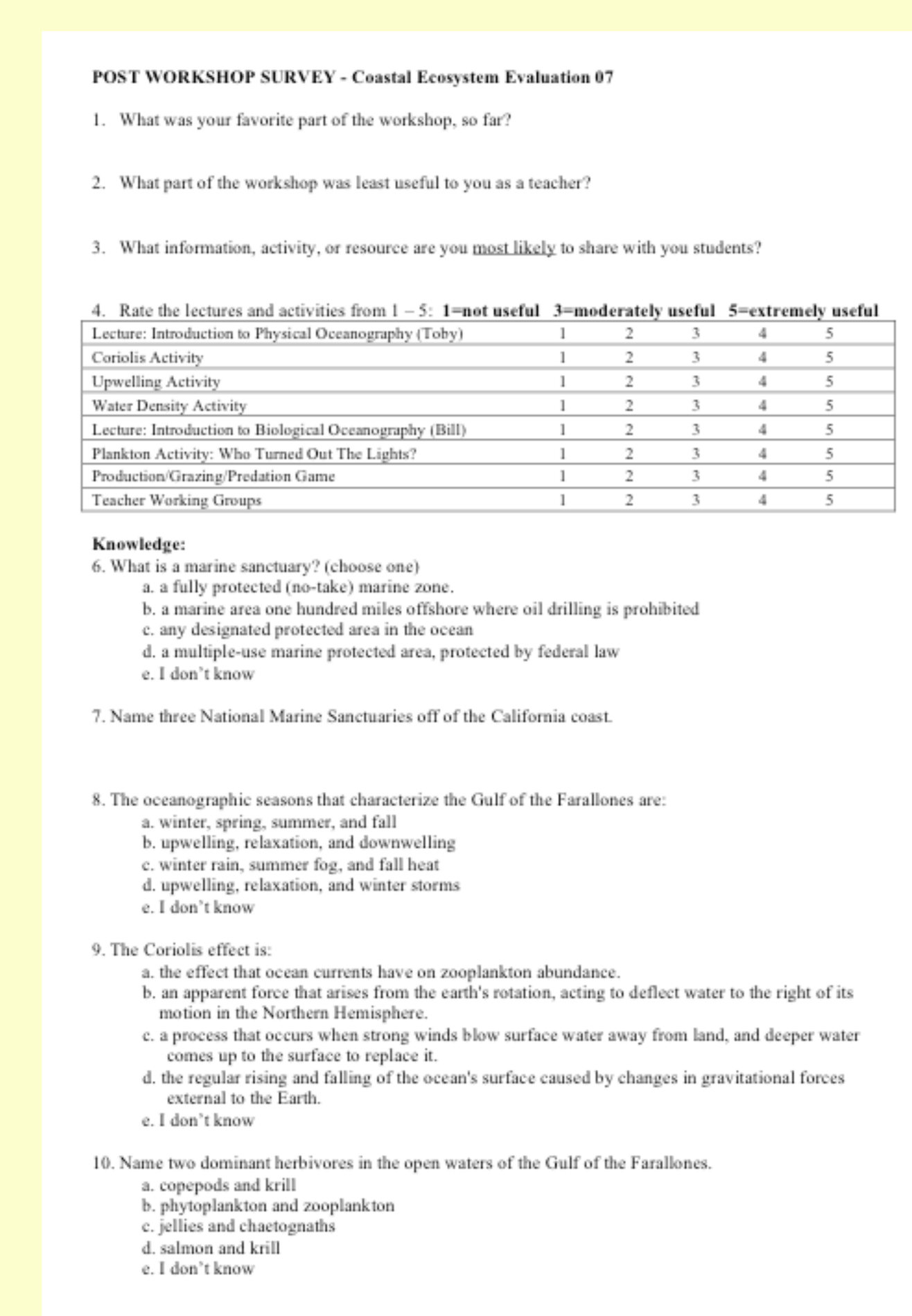
Knowledge:
3. What is a marine sanctuary? (choose one)
a. a fully protected (no-take) marine zone.
b. a marine area one hundred miles offshore where oil drilling is prohibited
c. any designated protected area in the ocean
d. a multiple-use marine protected area, protected by federal law
e. I don't know

4. Name three National Marine Sanctuaries off of the California coast.

5. The oceanographic seasons that characterize the Gulf of the Farallones are:
a. winter, spring, summer, and fall
b. upwelling, relaxation, and downwelling
c. winter rain, summer fog, and fall heat
d. upwelling, relaxation, and winter storms
e. I don't know

6. The Coriolis effect is:
a. the effect that ocean currents have on zooplankton abundance.
b. an apparent force that arises from the earth's rotation, acting to deflect water to the right of its motion in the Northern Hemisphere.
c. a process that occurs when strong winds blow surface water away from land, and deeper water comes up to the surface to replace it.
d. the regular rising and falling of the ocean's surface caused by changes in gravitational forces external to the Earth.
e. I don't know

7. Name two dominant herbivores in the open waters of the Gulf of the Farallones.
a. copepods and krill
b. phytoplankton and zooplankton
c. jellies and chaetognaths
d. salmon and krill
e. I don't know



POST WORKSHOP SURVEY - Coastal Ecosystem Evaluation 07

1. What was your favorite part of the workshop, so far?

2. What part of the workshop was least useful to you as a teacher?

3. What information, activity, or resource are you most likely to share with you students?

4. Rate the lectures and activities from 1 – 5: 1=not useful 3=moderately useful 5=extremely useful

Lecture: Introduction to Physical Oceanography (Toby)	1	2	3	4	5
Coriolis Activity	1	2	3	4	5
Upwelling Activity	1	2	3	4	5
Water Density Activity	1	2	3	4	5
Lecture: Introduction to Biological Oceanography (Bill)	1	2	3	4	5
Plankton Activity: Who Turned Out The Lights?	1	2	3	4	5
Production/Grazing/Predation Game	1	2	3	4	5
Teacher Working Groups	1	2	3	4	5

Knowledge:
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Other Comments: Please share suggestions and general comments below.

Figure 2: Pre- & Post-Workshop Survey

Evaluation surveys completed by teachers attending the *Coastal Ecosystem Workshop*.

Results from 2006-2007:

Teacher feedback..........

"I was so impressed by how informative the presentations were. These are some of the best workshops I have ever attended."

"The idea of collecting LiMPETS data that would be useful to "real science" is invaluable in education."

"The materials provided are excellent and really provide the resources necessary for this to be an enriching, exciting experience for students to collect and analyze scientific data. Thanks so much for this amazing resource! I can't wait to do this with my students next Fall!"

Highlighted Accomplishments

- 10 teacher workshops offered, 166 attendees
- Teachers gained new knowledge about coastal ecosystems and the Sanctuaries that help to protect them (Figure 3).
- 60% of teachers who attended an *Introductory LiMPETS workshop* implemented a LiMPETS program at their school.
- 44% of workshop participants spend more time teaching ocean sciences after the summer *Coastal Ecosystem Workshop* (Figure 4).

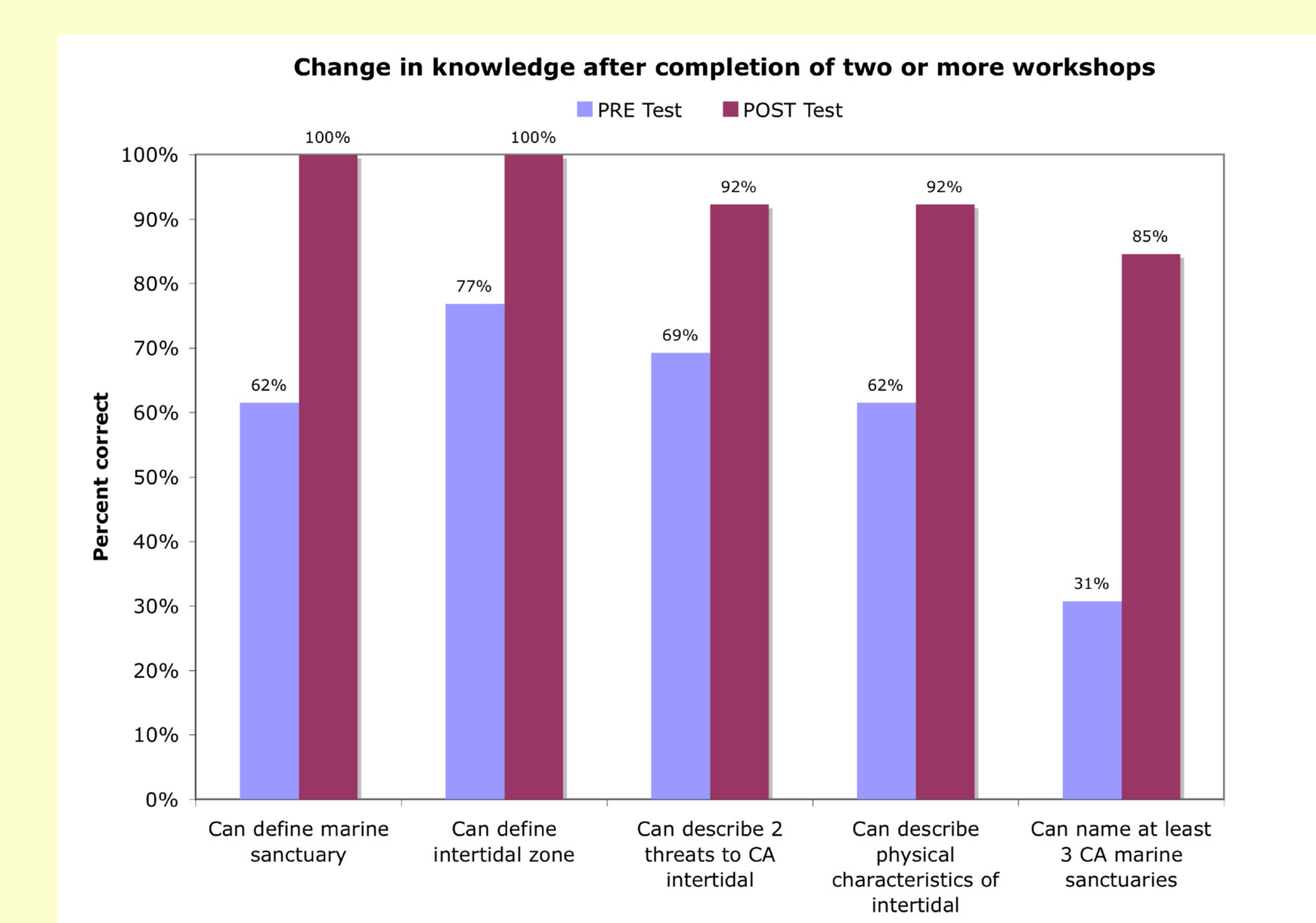

Figure 3: Workshops expand teachers' existing knowledge

Cumulative results of pre- and post- Saturday workshop evaluations demonstrate that teacher gained new knowledge after the completion of two or more workshops.

Figure 4: Teachers spend more time on ocean-related topics in class as a result of workshop.

Teachers who participated in the summer Coastal Ecosystem (CEC) Workshop were surveyed 7 months after the workshop. While 100% of teachers reported that they tried at least one activity in the CEC curriculum with their students, 44% reported that they spend more time teaching ocean sciences as a result of the workshop.